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Beck et al.

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[54] **MECHANISM FOR CENTERING ROLLS OF PAPER STOCK SUPPLIED FOR PRINTING**

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[73] Assignee: **Comtec Information Systems, Inc.**, Warwick, R.I.

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[51] **Int. Cl.**[6] **B41J 29/02**

[52] **U.S. Cl.** **400/692**; 400/88; 242/563.1

[58] **Field of Search** 400/88, 613, 613.1, 400/691, 692, 693, 693.1; 101/288; 242/554.1, 555.1, 563, 563.1, 566

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Primary Examiner—Ren Yan

Attorney, Agent, or Firm—K. J. LuKacher; M. LuKacher

[57] **ABSTRACT**

An improved mechanism for centering a roll of paper stock for printing in a portable printer is provided, in which the printer has a housing with a cavity and an opening from a side thereof to provide a receptacle for the roll. The centering mechanism includes a spindle disposed in the cavity toward the opening and mounted in the housing for rotation about an axis, and a pair of arms coupled to each other to move in opposite directions with respect to a center between the arms. The arms engage the two opposing ends of the roll when received on the spindle for centering the roll on the spindle. The arms are coupled to each other by a rack and pinion assembly which moves the arms in opposite direction to each other responsive to a force applied by an operator to one of the arms when a roll is received on the spindle.

19 Claims, 4 Drawing Sheets

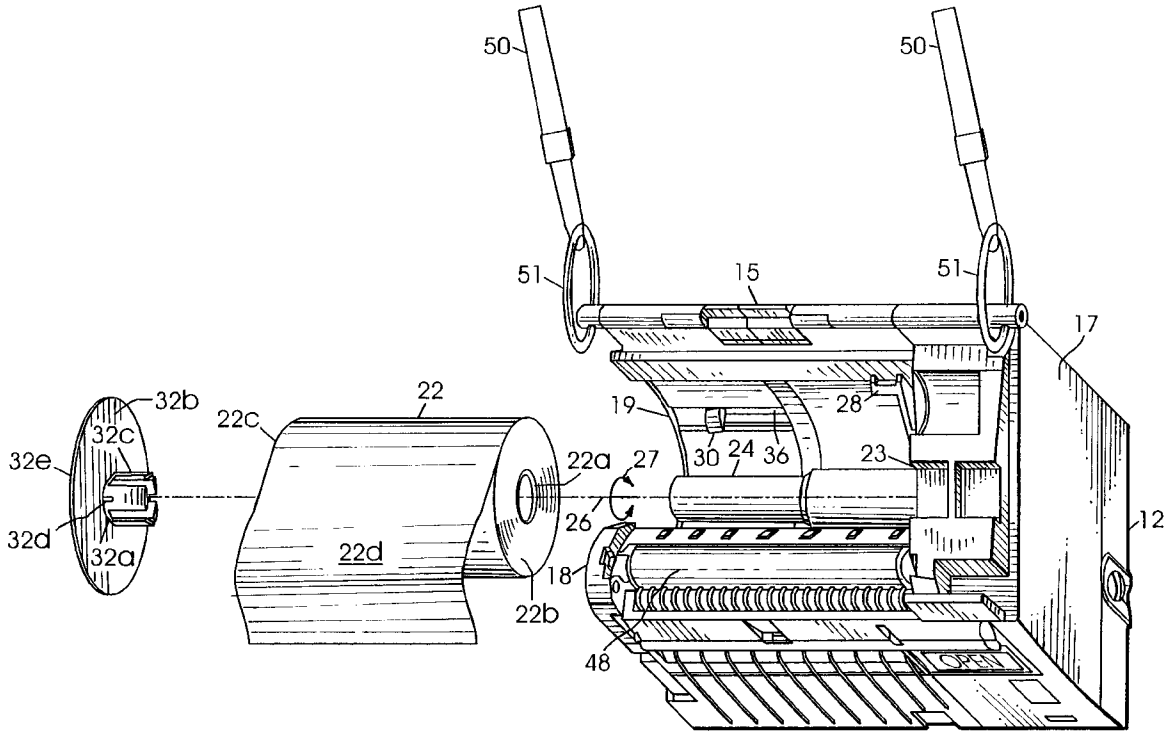
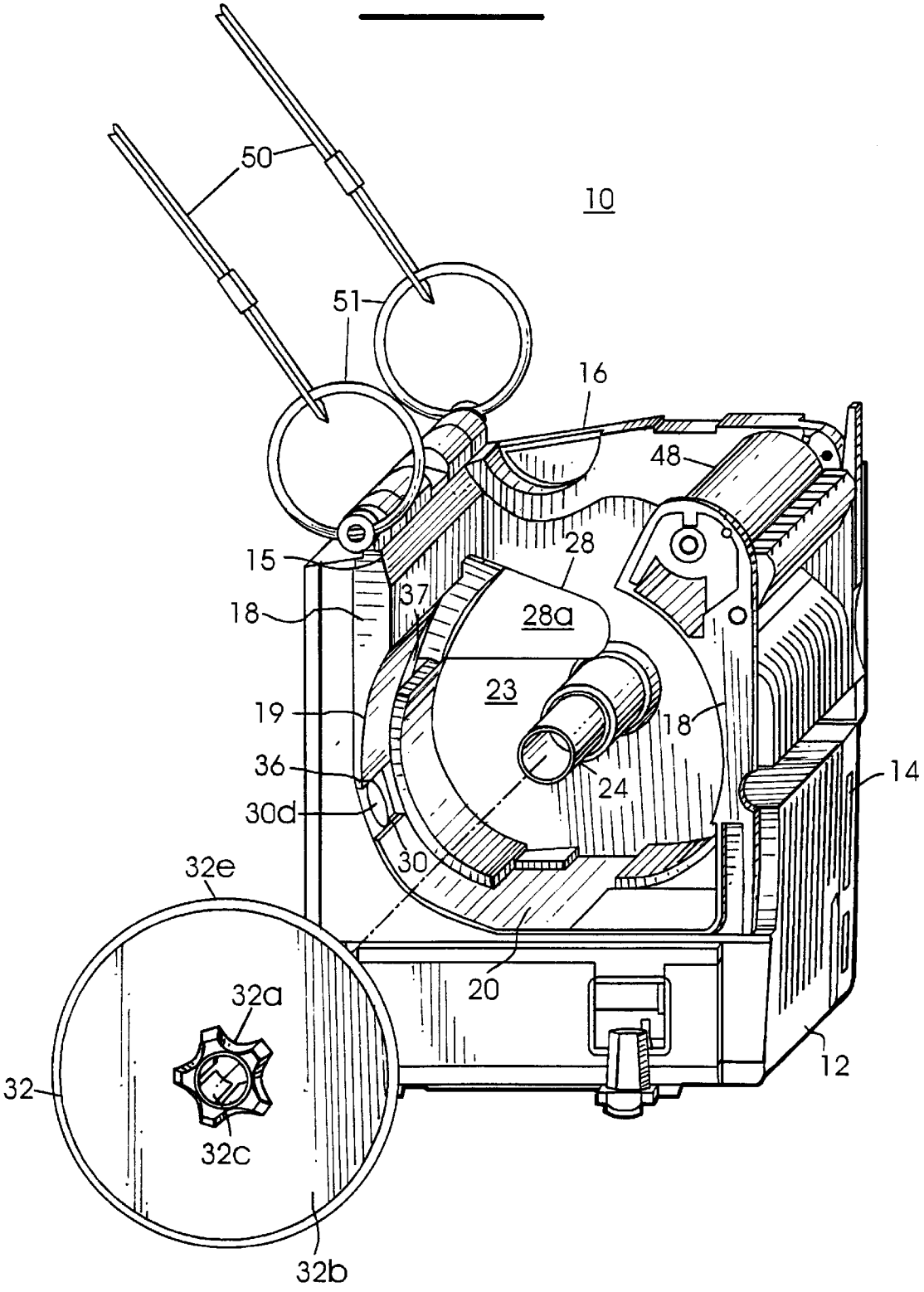


FIG. 1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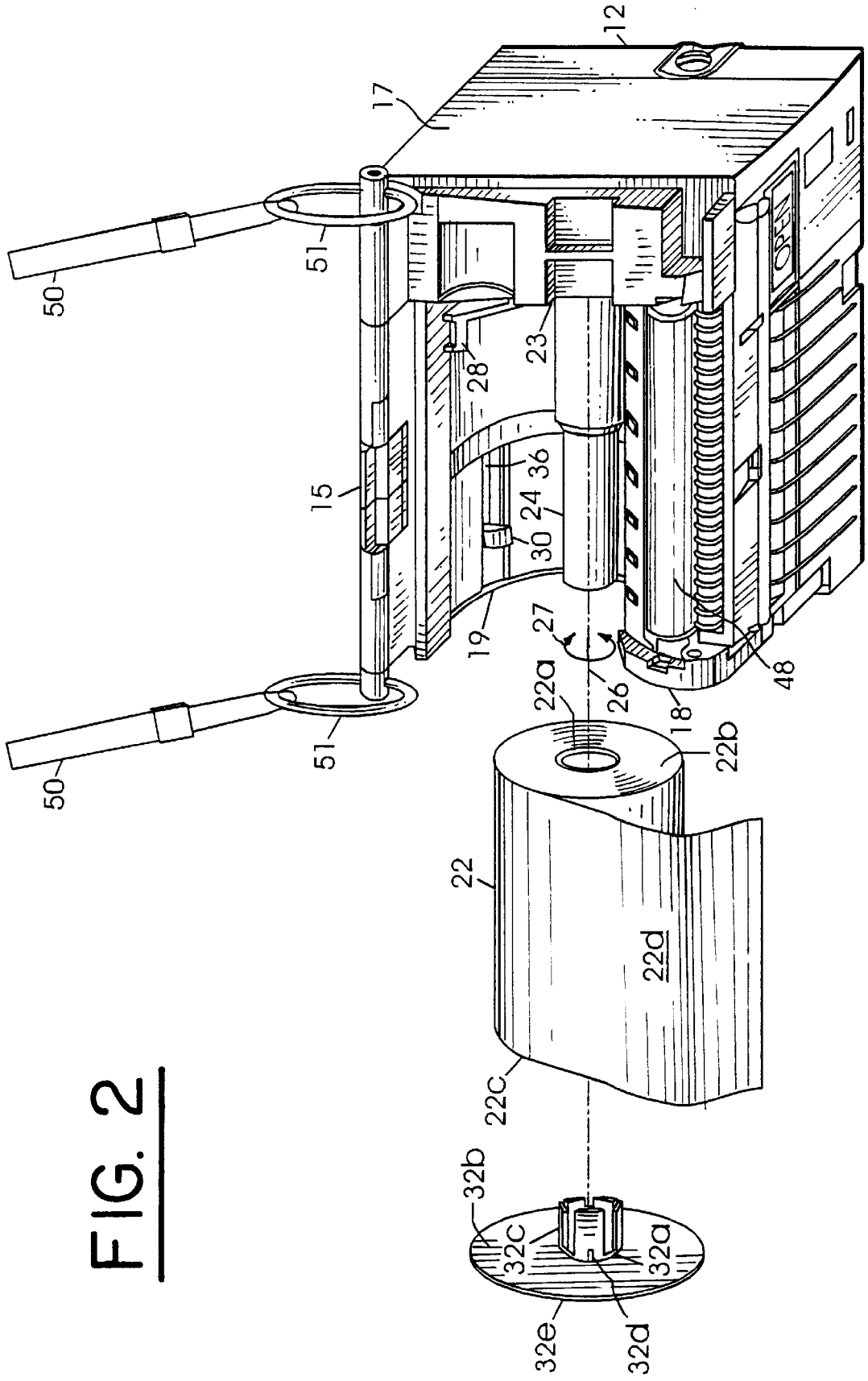
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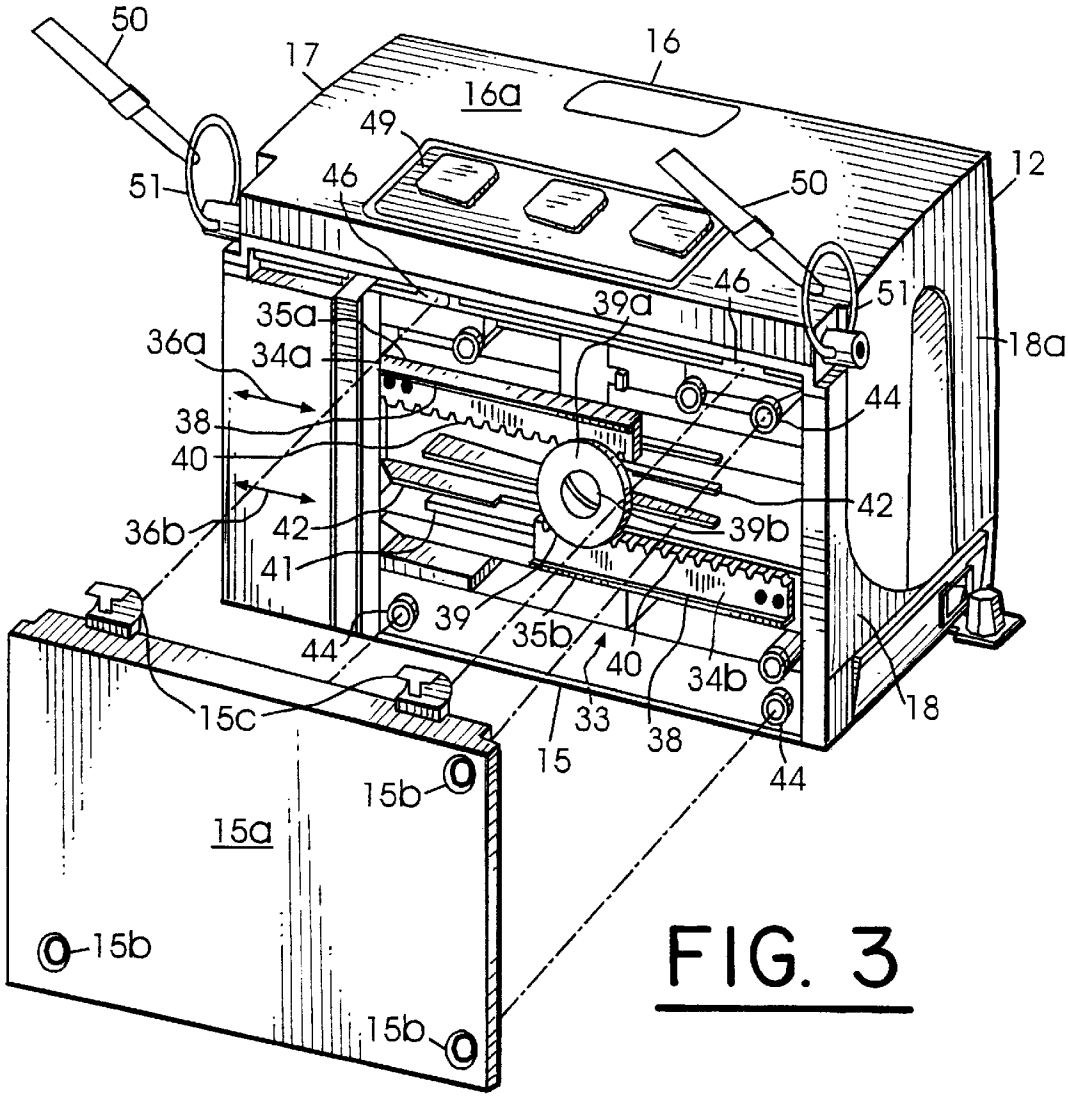
FIG. 2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36b
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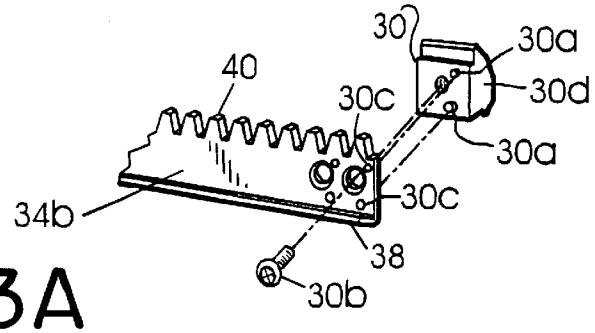
FIG. 3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30c
30a
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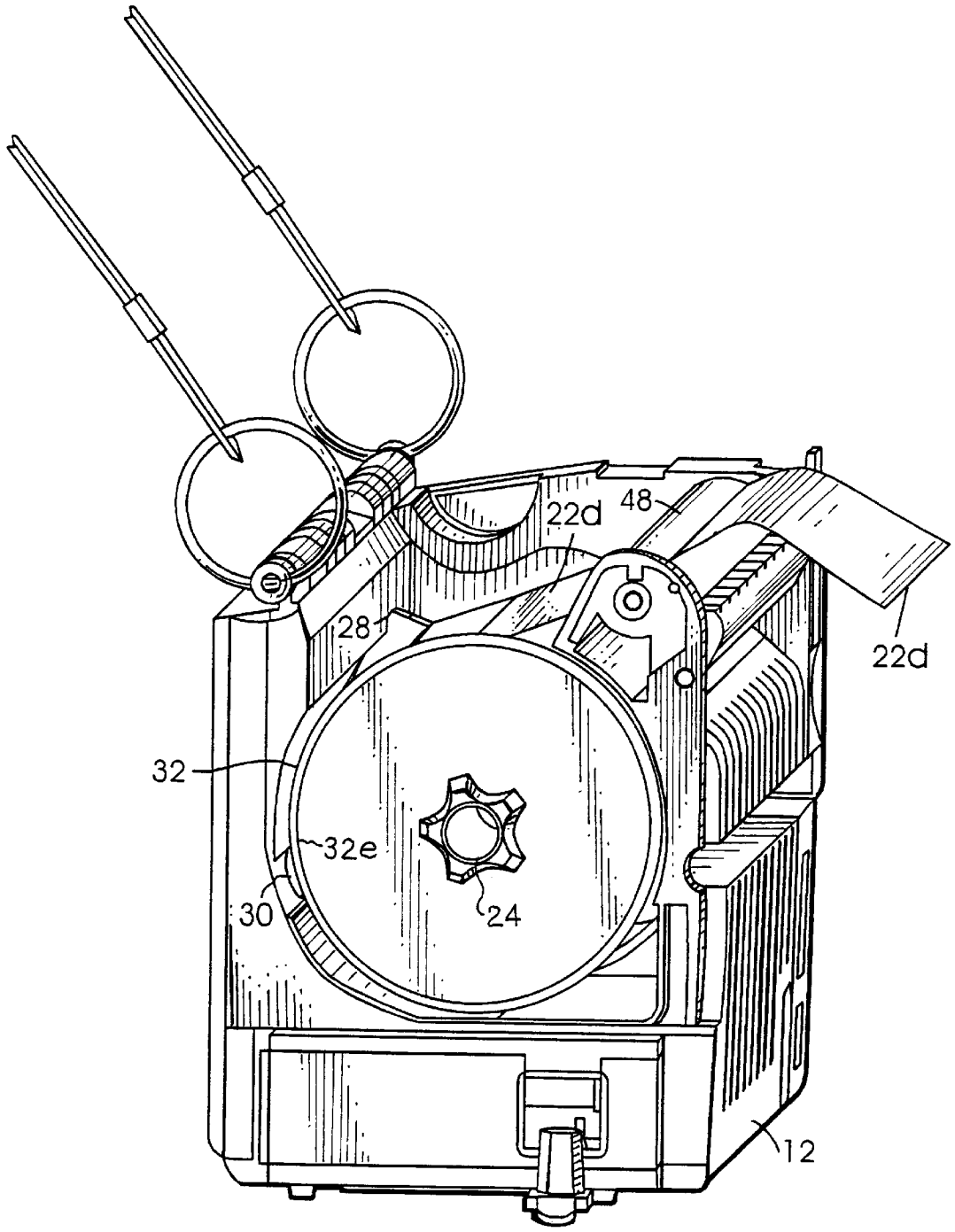
30c
38
30b

FIG. 3A

FIG. 4



MECHANISM FOR CENTERING ROLLS OF PAPER STOCK SUPPLIED FOR PRINTING

DESCRIPTION

1. Field of the Invention

The present invention relates to a mechanism for centering rolls of paper stock on a spindle which is especially useful in a portable printer, and particularly to, a mechanism for automatically centering rolls of paper stock in different widths. The mechanism provided by the invention is especially adapted for use in a portable label printer which is carried by an operator and may be hand held, and more especially such printers which are loaded from a side of the housing of the printer.

2. Background of the Invention

Conventional portable label printers generally use a roll of wound stock material, such as paper, which is loaded into the printer such that paper from the roll will properly feed and be aligned with a print head for printing by the print head. It is usually desired to provide in such printers a facility for using rolls having different width paper, such that labels of different widths may be printed. The widths may range between one and several inches.

To accommodate the range of roll widths, the print head is of a length sufficient to print along the widest width paper. With a roll loaded into the printer, the print head is yieldably biased by springs against a platen over which the paper is fed. Printing quality may be reduced if the bias varies across the width of the paper. Thus, maintaining uniform bias on the print head over the entire width is desirable. If the paper is not aligned on the platen, the edge of the paper may be presented to the print head causing it to tilt and distort the uniformity of the bias. To resolve this problem in a portable label printer, the roll should be centered in the printer along its width with respect to the print head, such that the bias will be even over the paper from the roll regardless of the paper's width.

Typically, centering a roll in a printer has utilized a top-loading scheme in which the roll is located in a printer cavity and two rotatable spindle members are urged by spring or springs into the tubular core of the roll to move the roll into a center position. It is often difficult to load the roll using this scheme, since an operator must physically separate the two spindle members from each other while simultaneously orienting the core of the roll such that each member will fit into the core when released. If the roll's core is not properly oriented between the two members, the roll will not be properly aligned when the members collapse together under the spring force. Misalignment of the roll can also cause the printer to malfunction in feeding paper from the roll and in printing on the paper. Further, due to the compactness of the printer, the printer cavity is small which can cause difficulty for the operator to insert his or her fingers to drop and maneuver the roll in the cavity. This centering scheme is used, for example, in label printers manufactured by Eltron International of Simi Valley, Calif., of model no. P2242. Side loading of rolls into printers has been shown in U.S. Pat. Nos. 5,267,800 and 5,447,379. However, centering of rolls of different widths has required manipulation and is not as operator friendly as desirable.

In addition, the top-loading scheme limits the size of the roll, i.e., the amount of paper stock wound on the roll, due to the narrow dimensions of the top opening through which the roll is received into the printer's cavity. Thus, depending on the amount of printer use, rolls frequently need to be replaced with new rolls, which can make the printer more costly to operate. A further drawback is that the roll is generally not sufficiently secured in the printer and can easily misalign due to jarring of the printer.

SUMMARY OF THE INVENTION

Accordingly, it is the principal object of the present invention to provide an improved mechanism which automatically centers a roll of paper stock on a spindle, thereby facilitating loading of rolls of different widths for printing in a printer.

It is another object of the present invention to provide an improved mechanism for centering a roll of paper stock in a portable printer in which the roll is side-loaded into the housing of the printer.

It is yet another object of the present invention to provide an improved mechanism for centering a roll in a portable printer which can reliably center rolls having different width paper and can easily be loaded by an operator.

Briefly described, the present invention includes a mechanism for centering a roll of stock in a portable printer which prints upon the stock from the roll. The roll may be a paper stock of adhesive back labels wound upon a tubular core, or other media wound on a roll. A housing of the printer has a cavity, and an opening from a side thereof to provide a receptacle for the roll. The centering mechanism includes a spindle disposed in the cavity toward the opening and mounted in the housing for rotation about an axis, and a pair of arms coupled to each other to move in opposite directions with respect to a center between the arms. The arms engage the two opposing ends of the roll when received on the spindle for centering the roll on the spindle about the center. The arms are coupled to each other by a rack and pinion assembly of the centering mechanism which moves the arms in opposite directions to each other.

One of the arms is provided by a first guide (the inner edge guide) facing one end of the roll. The other arm is provided by a projecting member and a second guide (the outer edge guide) which faces the other end of the roll and may lie adjacent to the projecting member. The rack and pinion assembly includes a first rack member coupled to the first guide to be moveable therewith, and a second rack member coupled to the projecting member to be moveable therewith. A pinion is engagable with the first and second rack members to move the first and second rack members in opposite directions to each other. The pinion can rotate about a fixed position in the housing which determines the center between the first and second guides of the arms.

To center a roll, an operator pushes the second guide onto the spindle after a roll is placed on the spindle. In response, the second guide applies a force against the roll as it is received on the spindle, thereby moving the roll along the spindle. This force moves the first and second rack members in opposite directions to each other by the force being conveyed against the first guide, via said roll, or the projecting member, via the second guide, until both the second guide lies adjacent the projecting member, and the first guide lies adjacent the roll.

BRIEF DESCRIPTION OF THE DRAWINGS

The foregoing objects, features and advantages of the invention will become more apparent from a reading of the following description in connection with the accompanying drawings in which:

FIG. **1** is a perspective view from a side of a portable printer having a housing, the top cover of which is removed to shown the centering mechanism according to the present invention;

FIG. **2** is a perspective exploded view of the printer of FIG. **1** from the top with the top cover broken away;

FIG. **3** is a perspective view of the printer of FIG. **1** from the rear showing the rack and pinion assembly of the centering mechanism;

FIG. **3**A is a perspective exploded view of part of the rack and pinion assembly shown in FIG. **3**; and

FIG. **4** is perspective view similar to FIG. **1** with a roll of stock loaded in the printer.

DETAILED DESCRIPTION OF THE INVENTION

Referring to the figures, a portable compact label printer **10** is shown having a housing **12** with a front portion **14**, a rear portion **15**, a top portion **16**, and opposing sides portions **17** and **18**. Side **18** has an opening **19** through which a roll **22** is mounted into a cavity **20** in housing **12**. Roll **22** is a roll of stock material **22***d*, such as adhesive backed paper carried on a web which is wound on a tubular core **22***a*, or may be any other media. A cover **18***a* is hingedly connected to housing **12** such that it closes opening **19** in side **18**, as shown in FIG. **3**. Cover **18***a* is not shown in FIGS. **1**, **2**, and **4** for purposes of illustrating the invention.

A mechanism is provided in housing **12** for automatically centering roll **22** as it is loaded from side **18** into cavity **20**. The centering mechanism includes a spindle **24** in cavity **20** which is mounted on a shaft (not shown) protruding about half the length of housing **12** toward opening **19** from a side wall **23** of cavity **20**. Spindle **24** has an internal bearing (not shown), which is coupled by a screw and washer to the end of this shaft, to allow spindle **24** to freely rotate along axis **26** as indicated by arrows **27**. The shaft may have steps of decreasing diameters from side wall **23** toward opening **19** to prevent spindle **24** from cantilevering as it rotates. The internal bearing may be a self-lubricating plastic bearing mounted about halfway in spindle **24**. The length of spindle **24** is longer than the widest possible width of roll **22**, defined by the length of core **22***a* between opposing ends **22***b* and **22***c* of the roll.

In cavity **20**, the centering mechanism further includes an inner edge guide **28**, a projecting member **30**, and an outside edge guide **32**. Inner edge guide **28** has a flange **28***a* which extends into cavity **20** and faces end **22***b* of the roll when the roll is loaded via its core **22***a* onto spindle **24**. Outer edge guide **32** has a hub **32***a* and a circular flange **32***b* which extends from hub **32***a*. Flexible fingers **32***c* extend from hub **32***a* generally perpendicular to the surface of flange **32***b* and have raised areas or tabs **32***d* (FIG. **2**). Hub **32***a* is slidable along spindle **24** with fingers **32***c* facing towards the side wall **23**. With roll **22** on spindle **24**, flange **32***b* faces end **22***c* of the roll. Flange **32***a* has an outer rim or end **32***e* which can adjacently lie against projecting member **30** when outer edge guide **32** slides along the spindle toward side wall **23**. The projecting member **30** extends into cavity **20** so as not to interfere with the loading of roll **22** on spindle **24**. Also, the circular diameter of flange **32***b* is larger than the diameter of roll **22**, such that a section **30***d* of projection member **30** will engage rim **32***c* during centering of the roll on spindle **24**. Cavity **20** may have an interior generally contoured to allow outer edge guide **32** to slide along a substantial length of the spindle **24** from opening **19**.

The centering mechanism has a rack and pinion assembly **33** which couples the inner edge guide **28** and projecting member **30** to each other, and enables them to move in opposite directions from each other approximately parallel to axis **26** of the spindle. The rack and pinion assembly **33** is shown in FIG. **3** with a rear cover **15***a* removed. Assembly **33** has upper and lower rack members **34***a* and **34***b* which are located in slots **35***a* and **35***b*, respectively. Rack members **34***a* and **34***b* each have an "L" or "T" shaped edge **38** which rides in slots **35***a* and **35***b*, respectively. Edge **38** is illustrated as "L" shaped in FIGS. **3** and **3**A. Arrows **36***a* and **36***b* represent the linear motion of each rack member **34***a* and **34***b* in their respective slot, which is also approximately parallel with axis **26** of the spindle. At one end of rack **34***b*, projecting member **30** is attached through a window **36** (FIG. **1**) in cavity **20** by a screw **30***b* threaded into member **30**, as shown in FIG. **3**A. Pins **30***a* are provided to assist in aligning projecting member **30** on rack member **34***b* via holes **30***c*. Inner edge guide **28** is similarly attached to the end of rack **34***a* through window **37** (FIG. **1**). Other attachment means or additional screws maybe used to attach inner edge guide **28** and projecting member **30** to their respective rack members. Racks **34***a* and **34***b* each engage, via their teeth **40**, opposite sides of a pinion **39**, such that they move in opposite directions within their respective slots responsive to rotation of pinion **39**.

Pinion **39** includes a circular flange **39***a* to retain rack members **34***a* and **34***b* in slots **35***a* and **35***b*, respectively, and a gear (not shown) having teeth which engage teeth **40** of rack members **34***a* and **34***b*. Preferably, flange **39***a* and this gear are part of a single molded assembly. Pinion **39** rotatably mounted to housing **12** by a screw **39***b* threaded into the housing which extends through a boss (or a washer) and the center of pinion **39**. Screw **39***b* may be a tapered head or shoulder screw.

Ribs **41** may be provided in housing **12** under rack member **34***b* to provide a level path for motion in slot **35***b*. Similarly, ribs may be provided under rack member **34***a* to provide a level path for motion in slot **35***a*. Also, raised ribs **42** may be provided in housing **12** to provide a gap between rear cover **15***a* and the rack and pinion assembly **33** when the cover is closed. Cover **15***a* may be attached by screws, through holes **15***b*, and hinges **15***c* into aligned holes **44** and slots **46**, respectively, in housing **12**.

Projecting member **30**, attached to rack member **34***b*, and inner edge guide **28**, attached to rack member **34***a*, move in opposite direction to each other toward and away from a center position between them. The center position is determined by the mounted location of pinion **39** in the housing **12**. The extent of the reciprocal opposite movement of inner edge guide **28** and projecting member **30** is determined by the size of windows **37** and **36**, respectively, along the direction of such movement. In this manner, inner edge guide **28** represents one of a pair of arms of the centering mechanism, while outer edge guide **32** with the projecting member **30** represent the other of the pair of arms when the outer edge guide is slid onto spindle **24** against projecting member **30**. The pair of arms is coupled to the rack and pinion assembly **33**, and thus coupled to each other, to move in opposite directions with respect to the center between the arms. The arms engage the opposing ends **22***b* and **22***c* of roll **22** when the roll is received on the spindle **24** to center the roll about the center position determined by the location of pinion **39**, as described in more detail below.

To center roll **22**, an operator pushes the outer edge guide **32** onto spindle **24** while placing a roll on the spindle (or after placing a roll on the spindle), such that fingers **32***c* of hub **32***a* are oriented in the direction of side wall **23** and the fingers lie between the spindle and the inner surface of core **22***a* of the roll. In response to the external force of the operator on outer edge guide **32**, the outer edge guide applies a force against the roll, thereby moving the roll along spindle

24. This force moves the first and second rack members **34***a* and **34***b* in opposite directions through rotation of pinion **39** by the force being conveyed either against the inner edge guide **28**, via the roll, or projecting member **30**, via the outer edge guide **32**, until both the outer edge guide lies adjacent the projecting member, and the inner edge guide lies adjacent the roll. Thus, the roll can easily be loaded and centered in housing **12**.

Whether the force applied to the outer edge guide **32** is conveyed to projecting member **30** or to the inner edge guide **28** depends on the width of roll **22** and the position of the inner edge guide when the roll is first placed on spindle **24**. For example, when the projecting member **30** meets the outer edge guide **32** before the roll **22** is adjacent the inner edge guide **28**, the outer edge guide will push the projecting member toward side wall **23**, until the other end **22***b* of the roll meets the flange **28***a* of the inner edge guide as the inner edge guide moves away from side wall **23**. However, if the roll **22** meets the inner edge guide **28** before the outer edge guide **32** meets the projecting member **30**, the roll will push the inner edge guide toward side wall **23** as it is moved along the spindle, until the outer edge guide meets projecting member **30** as the projecting member moves away from side wall **23**. In either case, the roll is automatically centered when the roll can no longer be pushed any farther into the housing. The opposing motion of the inner edge guide and the projecting member is achieved via the rack and pinion assembly **33** described earlier. Accordingly, rolls of different widths may automatically be centered in housing **12** while eliminating the possibility of a misaligned roll. In the preferred embodiment, rolls may vary from 1 to 4 inches in width between its ends **22***b* and **22***c* (FIG. **2**).

After centering roll **22**, it is locked or held in place on spindle **24** by fingers **32***c* which are pressured against the inner surface of core **22***a* by the force of spindle **24** against the fingers. Tabs **32***d* on fingers **32***c* extend into the material of the core, if such material is compliant, to grip the core. Preferably, the outer diameter of spindle **24** is tapered toward opening **19** in cavity **20** to reduce the space between the spindle and the core as the outer edge guide **32** slides toward side wall **23** on the spindle, thereby pressuring the fingers **32***c* and tabs **32***d* outwards toward the core **22***a* of the roll. FIG. **4** is similar to FIG. **1** and shows roll **22** loaded and centered in housing **12**. The roll is centered in the housing with respect to the position of pinion **39** in the housing. In other words, the roll is centered about the middle point of an imaginary line between the inner and outer edge guides **28** and **32**, where the imaginary line is approximately parallel to the axis **26** of the spindle. In the figures, the middle point is aligned with the center of the pinion **39**. However, the centered location of the roll along this imaginary line may be adjusted, such as by changing the location where the projecting member or inner edge guide is attached to their respective racks, or by moving the position of the pinion **39** in the housing.

After the roll is spent, its core **22***a* may be easily removed from housing **12**. Generally, the operator can pull the outer edge guide **32** off spindle **24** and the core of the spent roll will be retained on the outer edge guide by fingers **32***c*. A new roll can then be loaded and automatically centered as described above.

The housing **12** of the printer has a platen roller **48** with a rubber surface which is rotatably mounted in bearings between side **18** and side wall **23**. A motor (not shown) in the housing is coupled to one end of the platen **48** to drive the platen such that when the paper stock **22***d* from roll **22** is threaded around the platen the paper is pulled from roll as the roll freely rotates on spindle **24**. A print head (not shown) is located in a hinged top cover **16***a* (FIG. **3**), such that when cover **16***a* is closed in housing **12**, the print head extends over a substantial length of the platen **48** and is centered in relation to the center position of the rack and pinion assembly **33**. Thus, the center of the paper from rolls of different paper widths loaded in housing **12** will be identical with respect to the print head. The print head may be a thermal print head which is controlled to print indica on the paper as the paper is pulled by platen **48**. Electronics is provided in the printer for controlling the operation of the print head and rotation of the platen **48**, which may be responsive to switches **49** (FIG. **3**). The motor and electronics are powered by a battery (not shown) in the housing. Straps **50** through rings **51** mounted to housing **12** may facilitate carrying of the printer by an operator, such as on a belt.

From the foregoing description, it will be apparent that there has been provided an improved mechanism for centering rolls of paper stock supplied for printing in a portable printer. Variations and modifications in the herein described system in accordance with the invention will undoubted suggest themselves to those skilled in the art. Accordingly, the foregoing description should be taken as illustrative and not in a limiting sense.

What is claimed is:

1. A mechanism for centering a roll of stock in a printer which prints upon the stock from said roll, said roll having a tubular core and two opposing ends, said printer having a housing with a cavity and an opening from a side thereof to provide a receptacle for said roll, said mechanism comprising:

a spindle disposed in said cavity towards said opening and mounted in said housing for rotation about an axis;

a pair of arms coupled to each other to move in opposite directions with respect to a center between said arms; and

said arms being engagable with the opposing ends of said roll when received on said spindle for centering said roll on said spindle about said center.

2. The mechanism according to claim **1** wherein said arms are part of a rack and pinion assembly which moves said arms in opposite directions to each other.

3. The mechanism according to claim **1** wherein one of said pair of arms represents a first guide facing said first opposing end of said roll when in said cavity, and said other of said pair of arms represents a projecting member and a second guide adjacent to said projecting member and facing said second opposing end of said roll when in said cavity.

4. The mechanism according to claim **3** further comprising a first rack member coupled to said first guide to be moveable therewith, a second rack member coupled to said projecting member to be moveable therewith, and a pinion engagable with said first and second rack members to move said first and second rack members in opposite directions to each other.

5. The mechanism according to claim **4** further comprising two slots in said housing in which said first and second rack members, respectively, slide, and said pinion being rotatably mounted in said housing between said slots to engage teeth on said first and second rack members to move said members in said slots.

6. The mechanism according to claim **4** wherein said first guide and projecting member each have a window in said housing through which said first guide and said projecting member are attached to their respective rack members.

7. The mechanism according to claim **4** wherein said second guide applies a force against said roll as it is received

on said spindle to move said first and second racks in opposite directions to each other by said force being conveyed against said first guide, via said roll, or said projecting member, via said second guide, until both said second guide lies adjacent said projecting member and said first guide lies adjacent to said roll.

8. The mechanism according to claim **3** wherein said second guide comprises a hub slidable along said spindle, and a flange extending from said hub which lies adjacent said projecting member when said roll is loaded on said spindle.

9. The mechanism according to claim **8** wherein said hub has fingers extending between said spindle and the core of said roll to lock said roll on said spindle when centered on said spindle.

10. The mechanism according to claim **8** wherein said flange is circular with a diameter larger than the diameter of the roll, and said projecting member engages the outer circumferential end of said flange.

11. The mechanism according to claim **3** wherein said first guide comprises a flange facing said roll when said roll is received on said spindle.

12. The mechanism according to claim **1** wherein said spindle is tapered along its length.

13. The mechanism according to claim **1** wherein said arms move in said opposite directions parallel to said axis.

14. The mechanism according to claim **1** wherein said arms move in opposite directions to each other responsive to an external force applied to one of said arms.

15. The mechanism according to claim **14** wherein said external force is applied by an operator to one of the arms when said roll is received on said spindle.

16. A method for centering a roll of stock in a printer, said printer having a housing with a cavity and an opening from a side thereof to provide a receptacle for said roll, a spindle disposed in said cavity toward said opening, and a pair of arms which are coupled to each other to move in opposite directions with respect to a center between said arms, said method comprising the steps of:

placing said roll onto said spindle;

pushing said roll along said spindle to operate said pair of arms to move in opposite directions with respect to said center; and

centering said roll about said center between said arms as said pushing step is carried out.

17. The method according to claim **16** wherein said arms are part of a rack and pinion assembly which moves said arms in opposite directions to each other.

18. The method according to claim **16** further comprising the steps of:

positioning part of one of said arms onto said spindle with said roll.

19. The method according to claim **16** wherein said pushing step is carried out by pushing at least one of said arms.

* * * * *